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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/715,777	11/17/2003	George Borshukov	70086.00022	4553

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CONNOLLY BOVE LODGE & HUTZ LLP
P.O. BOX 2207
WILMINGTON, DE 19899

EXAMINER	
LIEW, ALEX KOK SOON	
ART UNIT	**PAPER NUMBER**
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/715,777	BORSHUKOV ET AL.	
	Examiner	Art Unit	
	Alex Liew	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 July 2007*.

2a)☐ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12 and 16-20* is/are rejected.

7)☒ Claim(s) *13-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

The amendment filed on July 3, 2007 is entered and made of record.

Response to Applicant's Arguments

1. On page 8 of the reply, the applicant stated: [Geng fails to disclose or suggest "generating a two-dimensional light intensity matrix entry mapped to a unique surface element of the surface geometry, each matrix entry mapped to a unique surface element of the surface geometry, each matrix entry representing a modeled light intensity correlated to a mapped unique surface element of the digital object,"]

The examiner disagrees. Geng discloses generating a two-dimensional light intensity matrix entry mapped to a unique surface element of the surface geometry (see figure 4 – 402, using the three-dimensional face image, two dimensional image are generated using various lighting conditions), each matrix entry mapped to a unique surface element of the surface geometry (see figure 1 – 101, for each three-dimensional image a plurality of two-dimensional images are generated, with each two-dimensional image representing plurality of orientations of the three-dimensional image), with each matrix entry representing a modeled light intensity correlated to a mapped unique surface element of the digital object (refer back to figure 4, the plurality of two-dimensional images are generated from a three dimensional image using various lighting conditions and within each two-dimensional image, an image is represented by two dimensional matrix, with each element inside the matrix representing pixel and lighting value).

2. On page 8 of the reply, the applicant stated: [The present specification defines a "light intensity matrix" as a light map made up of "lumels."] The examiner suggests adding this term "lumel" to claim 1 to clarify the elements in the "light intensity matrix." At the present moment, the elements in "light intensity matrix" can be interpret as pixels or vowels.

3. On page 8 of the reply, the applicant stated:[A photographic image as disclosed by Geng is not a light intensity matrix because it does not map brightness or luminosity values from a standard surface of a modeled object. Indeed, the images shown in Fig. 17 of Geng are taken of a real object, not of a modeled object.]
The "modeled object" can be interpreted as a live-modeled object or a computer generated modeled object. The examiner suggests clarifying the meaning of "modeled object" to include a computer generated modeled object.

4. On page 9 of the reply, the applicant stated: [Mihara therefore fails to disclose any blurring or other operation performed on a light intensity matrix.] Mihara does not disclose blurring intensity image. In the examiner's new search, Gallagher (US pat no 6,400,848) discloses blur the intensity matrix, thereby producing a blurred matrix (see figure 3 – S12, is a partial step within S6 of figure 2) and rendering the digital object, using matrix entries from the blurred matrix to determine pixel values for the digital

object (see figure 2, the output of S10 is the rendered digital object image, the object in the digital image is shown in figure 4).

One skilled in the art would include a blurring image step because to eliminate noises in the images, which will be use to generate a three dimensional image of the object, improving the image quality (see Gallagher column 3, lines 12 – 16).

The combination of Geng and Gallagher disclose the claimed invention of claim 1.

DETAILED ACTION

Claim Objections

Claims 13 – 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 – 5, 8 – 11 and 16 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geng (US pub no 2003/0123713) in view of Gallagher ('848).

With regards to claim 1, Geng discloses a method of for rendering a digital object, the method comprising

- receiving information defining a digital object (see fig 1 – 102 – the camera receives images of the three dimensional object of the face), wherein the digital object comprises a three-dimensional surface geometry (the face has an oval shape), and wherein the information is sufficient for defining modeled light reflected from the surface geometry of the digital object in a modeled light environment (see fig 5 and 6 – different lighting conditions are applied to the 3D face to obtain color information, paragraph 67) and
- generating a two-dimensional light intensity matrix, each matrix entry mapped to a unique surface element of the surface geometry, each matrix entry representing a modeled light correlated to a mapped unique surface element of the digital object (see fig 17 – two dimensional images are obtained from imaging the three dimensional object face with each value in the images representing an intensity value, which represent a color value as discussed in citation of previous limitation).

Geng also discloses using Gabor filters to locate feature points of the three-dimensional face (see paragraph 67 and 68), but does not disclose blurring a two dimensional image.

Gallagher discloses blur the intensity matrix, thereby producing a blurred matrix (see figure 3 – S12, is a partial step within S6 of figure 2) and rendering the digital object, using matrix entries from the blurred matrix to determine pixel values for the digital

object (see figure 2, the output of S10 is the rendered digital object image, the object in the digital image is shown in figure 4).

One skilled in the art would include a blurring image step because to eliminate noises in the images, which will be use to generate a three dimensional image of the object, improving the image quality (see Gallagher column 3, lines 12 – 16).

The combination of Geng and Gallagher disclose the claimed invention of claim 1.

With regards to claim 2, Geng discloses a method of claim 1, wherein the generating step further comprises computing a modeled light intensity for each matrix entry using detailed skin topographical data (see fig 5 and 6 – the color information of the face are obtained from the different lighting conditions, also obtains the shape of the face, also the skin is on the surface of the face).

With regards to claim 3, Geng discloses a method of claim 2, wherein the generating step further comprises processing the detailed skin topographical data in the form of a bump map (in the specifications of the current patent application, the bump map is define as texture maps, on page 8 lines 8 – 10, see fig 6 and paragraph 56 which discloses texture mapping of the three dimensional face).

With regards to claim 4, Geng discloses a method of claim 2, further comprising obtaining the detailed skin topographical data by measuring a three-dimensional

structure of a skin surface sample (see fig 21 – the camera obtains the depth information of the shape of the face, paragraph 21).

With regards to claim 5, Geng discloses a method of claim 1, wherein the rendering step further comprises using color values from a color map to determine pixel color values for the digital object (see paragraph 56 – each pixel in the three-dimensional image obtains a final color value).

With regards to claim 8, an extension to rejection of claim 1, Gallagher discloses blurring step further comprises convolving the intensity matrix (all basic filtering process are done through convolution).

With regards to claim 9, Geng and Gallagher disclose all of the claim elements / features as discussed above in rejection for claim 1 and incorporated herein by reference, but fail to disclose processing the light intensity matrix using a Fast Fourier Transform. However, it is well known in the art of image analysis / processing to process any two dimensional image with Fast Fourier Transform (MPEP 2144.03). One skill in the art would include Fast Fourier Transform in blurring process because the transformed images does not have to use convolution to filter images, where convolution operation includes multiplications and additions, in Fourier domain the image representations include one step multiplication to filter images.

With regards to claim 10, an extension to the rejection of claim 1, Gallagher discloses blurring step further comprises executing a blurring algorithm of the form exp $(-(x^2 + y^2)/\sigma)$, where x and y are the horizontal and vertical widths, respectively, of the blur kernel in number of lumels, exp is the base of the natural logarithm, and σ is the spreading parameter (the form exp $(-(x^2 + y^2)/\sigma)$ is a Gaussian filter, which is shown in fig 5 – S100).

With regards to claim 11, Geng discloses a step of generating a light intensity three-dimensional image for each of three colors separation channels (see paragraph 56), but does not disclose a two-dimensional matrix for filtering. Gallagher disclose a two-dimensional matrix for filtering. One skill in the art would filter / blur a two dimensional image over a three dimensional image is because to save processing time, where processing a three-dimensional image will take n times longer to process, where n is the number of depth information in the three dimensional image.

With regards to claim 16, see the rationale and rejection for claim 1.

With regards to claim 17, see the rationale and rejection for claim 8. The blurring algorithm is performing convolution on the input image of the face and filter kernel.

With regards to claim 18, see the rationale and rejection for claim 5.

With regards to claim 19, see the rationale and rejection for claim 5.

With regards to claim 20, see the rationale and rejection for claim 1. In addition, Geng in figure 5 and 6, obtaining color images of the face from different lighting conditions.

3. Claims 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geng ('713) in view of Gallagher ('848) as applied to claim 11 further in view of Gatti (US pub no 2002/0009224).

With regards to claim 6, Geng discloses all of the claim elements / features as discussed above in rejection for claim 1 and incorporated herein by reference, but fails to disclose mip mapping to two dimensional image. Gatti performs MIP mapping to two-dimensional image to obtain three-dimensional image (see paragraph 43, mip mapping is discussed on page 15 lines 9 – 12 of the specification of the current invention). One skill in the art would use MIP mapping to obtain three-dimensional image from two-dimensional is because to obtain more detailed surface shape of the face object to improve color recognition of the skin.

With regards to claim 7, see the rationale and rejection for claim 5.

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Geng ('713) in view of Gallagher ('848) as applied to claim 11 further in view of Wober (US pat no 5,748,792).

Geng discloses all of the claim elements / features as discussed above in rejection for claim 11 and filtering three dimensional image with Gabor filter (see paragraph 67 and 68), but does not explicitly disclose whether it is done in the spatial domain, by convolving the spatial three dimensional image with h(k), or the Fourier domain, by multiplying the frequency information of the three dimensional image with the frequency information of the filter window. Wober discloses multiplying the input image with a plurality of filters in the Fourier domain (see fig 16 – the input image is multiplied by three different filters, H1, H2 and H3, independently, also see col. 6 lines 34 – 52). One skill in the art would include multiplying filter image with input image because the transformed images does not have to use convolution to filter images, where convolution operation includes multiplications and additions, which takes more time, in Fourier domain the image representations include one step multiplication to filter images, which save processing power and time.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Liew whose telephone number is (571)272-8623. The examiner can normally be reached on 9:30AM - 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Bella can be reached on (571) 272-7778. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Alex Liew
AU2624
8/8/07

Matthew C. Bella

MATTHEW C. BELLA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600